

LONG-PISTON HYDRAULIC MACHINES

ABSTRACT

[66] Smaller and lighter hydraulic pump/motors are provided with pistons having body portions substantially as long as the axial length of the respective cylinders in which they reciprocate. A plurality of respective lubricating channels, formed circumferentially and radially transecting the walls of each cylinder, is each positioned to be closed at all times by the axial cylindrical body of each respective piston during its entire stroke. Each lubricating channel is interconnected, one to another, to form a single, continuous lubricating passageway entirely within the cylinder block and not connected by either fluid "input" or fluid "output" passageways, being replenished solely by blow-by entering from the valve end of each cylinder. A plurality of sealing members, each located near the open end of each cylinder, substantially eliminates blow-by from this lubricating passageway, thereby significantly increasing volumetric efficiency. The resulting improved lubrication, in combination with unique spring-biased hold-down assemblies, permits use of variable-angle swash-plate arrangements that require neither dog-bones at the outer ends of the pistons nor conventional nutating-only wobblers.